UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER
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ART UNIT	PAPER NUMBER
2624	

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Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on <u>19 June 2003</u>.

2a) ☐ This action is **FINAL**.   2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) <u>1-37</u> is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) <u>1-21 and 24-37</u> is/are rejected.

7) ☒ Claim(s) <u>22 and 23</u> is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☒ The drawing(s) filed on <u>19 June 2003</u> is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a) ☐ All   b) ☐ Some * c) ☐ None of:

      1. ☐ Certified copies of the priority documents have been received.

      2. ☐ Certified copies of the priority documents have been received in Application No. _____.

      3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
    Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

Claims 22 and 23 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

With regards to claim 22, the examiner cannot find applicable prior art and suggestions disclosing projecting coded light onto the scene to create a pattern of elements includes creating the pattern so that the detectable characteristics identify columns in the projection array and so that the columns are repeated in a staggered arrangement in combination with limitations in claims 1 and 12.

Claim Rejections - 35 USC § 102

1.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2.   Claims 1 – 5, 7, 10, 12, 13, 15 – 21, 25 – 27 and 29 – 36 are rejected under 35 U.S.C. 102(b) as being anticipated by Batlle (Titled "Recent Progress in Coded Structured Light as a Technique to Solve the Correspondence Problem: A Survey").

With regards to claim 1, Batlle discloses a method for detecting characteristics of an object, the method comprising

- identifying a projection array used to project coded light onto a scene containing the object (see fig 3 – the scene shows three objects – under 'Posdamer-Altschuler'), wherein the projection array comprises a plurality of projection elements (see fig 4 – first, second and third pattern),

- obtaining an image of the scene with the coded light projected onto it (see fig 3 – the 'captured image' is read as the image of the scene),

- identifying a plurality of image elements forming an image array from the image (see fig 2 – each point in the projected image is mapped into the grabbed image – the grabbed image contains plurality of points) and

- for each image element (see paragraph below equation 43 – $xp1$ and $yp1$ are each of the image point in the image array), determining correspondence information that can be used to determine which projection element in the plurality of projection elements corresponds to that image element (see section 4.2. Calibration – matrix A is the corresponds information where it relates an object point with its projection on the captured image and on the projector image – the finding of this matrix is shown on the paragraph below equations 31 and 32), wherein determining correspondence information for each element is performed independently of knowing correspondence information for any other image element (see equation 43 – $xp0$ and $yp0$ do not depend on points that are

neighbors of xp1 and yp1, e.g. set: xp1 + 1 and yp1 + 1 represent image points

from a different position).

With regards to claim 2, Batlle discloses a method of claim 1, further comprising

determining position information for each identified image element based at least in part

on the correspondence information for that image element (see paragraph below

equation 43 – xp1 and yp1 are position information of the pixels in corresponding image

array).

With regards to claim 3, Batlle discloses a method of claim I, further comprising

determining position information for each identified image element based at least in part

on the correspondence information for that image element and on a position of a

projector that supplies the projection array relative to a camera that obtains the image

array (see paragraph below equation 43 – xp1 and yp1 are position information of the

pixels in corresponding image array and see fig 2 – points on the projected image is

mapped into the grabbed image).

With regards to claim 4, Batlle discloses a method of claim 1, wherein determining

correspondence information includes determining a row coordinate and a column

coordinate in the image array for one or more image elements based at least in part on

a row coordinate and a column coordinate in the projection array (see fig 2 – projected

image and grabbed image – both images consists of plurality of rows and columns).

With regards to claim 5, Batlle discloses a method of claim 1, wherein determining correspondence information includes determining a row coordinate and a column coordinate in the image array for one or more image elements and for each of the one or more image elements, determining a row coordinate and a column coordinate for an element in the projection array that corresponds to that image element (see paragraph below equation 43 – xp1 and yp1 are position information of the pixels in corresponding image array and see fig 2 – plurality of points on the projected image is mapped into the grabbed image).

With regards to claim 7, Batlle discloses a method of claim 1, wherein the step of determining correspondence information is performed without having to first determine correspondence information for an element in the plurality of image elements that is designated as being a first element in a sequence of elements that correspond substantially to an entire row of elements in the projection array (see equation 43 – the corresponds image array points to projection points are one to one, the projection point xp0 and yp0 does not depend on xp1 + 1, yp1 + 1 or any shifted information from the image array).

With regards to claim 10, Batlle discloses a method of claim 1, wherein identifying a projection array includes identifying data representing a tangible medium used to

pattern light emitted from a projector (see fig 3 – the scene is a tangible medium – shows three objects to be identified).

With regards to claim 12, Batlle discloses a method of claim 1, further comprising the step of projecting coded light onto the scene to create a pattern of elements having a detectable characteristic belonging to a set of two or more characteristic, wherein the pattern of elements is created from the projection array (see fig 4 – first and second patterns represents first and second characteristics – the patterns are projected onto the scene by the projector shown in fig 3).

With regards to claim 13, Batlle discloses a method of claim 12, wherein each of the characteristics in the set is a geometric characteristic that is distinguishable from an other geometric characteristic in the set (see fig 4 – first pattern – the size of the rectangular coded section is 4 by 8, second pattern – the size of the rectangular coded section is 2 by 8 – the first and second pattern are distinguishable).

With regards to claim 15, see the rationale for claim 13.

With regards to claim 16, Batlle discloses a method of claim 12, further comprising

- determining a sequence of values that can identify each of the projection elements in the projection array (see fig 4 – the patterns are projected on to the

scene to be determine – the sequence consists of binary, on or off see page 969

first column 6.1. – first paragraph),

- assigning a value used in the sequence to each characteristic in the set of two or

  more characteristics (see fig 4 – first and second patterns are read as the two

  characteristics) and

- wherein the step of projecting coded light includes projecting each projection

  element in the projection array as one of the characteristics in the set of two or

  more characteristics so that the sequence can be at least partially reflected in the

  pattern based on the value assigned to each characteristic (see fig 3 – the

  patterns are projected on to the scene with first, second and third pattern, which

  have three characteristics).

With regards to claim 17, see the rationale of claim 16.

With regards to claim 18, Batlle discloses a method of claim 16, wherein determining a

sequence of values includes determining the sequence comprising non-repeating binary

values (see fig 4 – first pattern – for each row the binary sequence is non-repeating for

4 bits).

With regards to claim 19, see the rationale for claim 18. The value of N in fig 4 first

pattern of Battle is 4.

With regards to claim 20, see the rationale for claim 18. In addition, the sequences of binary values are assigned to each column in the projection array in fig 4 of Batlle.

With regards to claim 21, Batlle discloses a method of claim 12, wherein projecting coded light onto the scene to create a pattern of elements includes creating the pattern so that the detectable characteristics identify columns (see fig 4 – first pattern consists of 4 columns that are coded in dark) in the projection array and so that each row in the projection array has the same set of columns (the dimension of the first pattern is n by n).

With regards to claim 25, Batlle discloses a method of claim 1, wherein one or more steps of the method are performed by one or more processors executing instructions stored on a computer-readable medium (it requires a computer processor to perform the functions in claim 1 which requires computer programs).

With regards to claim 26, see the rationale for claim 12.

With regards to claim 27, see the rationale for claim 13.

With regards to claim 29, see the rationale for claim 15.

With regards to claim 30, see the rationale for claim 17.

With regards to claim 31, see the rationale for claim 18.

With regards to claim 32, see the rationale for claim 19.

With regards to claims 33 and 35, see the rationale for claim 12. In addition, fig 4 of

Batlle shows a projector and a camera.

With regards to claim 34, see the rationale for claim 25.

With regards to claim 36, see the rationale for claim 1.

Claim Rejections - 35 USC § 103

1.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

2.   Claims 8, 9, 11, 24 and 37 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Batlle in view of official notice.

With regards to claim 8, Battle discloses all of the claim elements / features as

discussed above in rejection for claim 1 and incorporated herein by reference, but does

not explicitly disclose identifying missing element. However, it is well known in the art of

image analysis to find missing image elements (see MPEP 2144.03 – official notice). It

would have been obvious to one having ordinary skill in the art at the time of the

invention was made to include a step of identifying missing element because to fill in the

missing image element to complete the entire image so the observer will have a clear

view of the scene in the image.

With regards to claim 9, Battle discloses all of the claim elements / features as

discussed above in rejection for claim 1 and incorporated herein by reference, but does

not explicitly disclose compensating for the missing image elements by using image

elements that are congruent to the missing image elements. However, it is well known

in the art of image analysis to compensating for the missing image elements by using

image elements that are congruent to the missing image elements, also called pixel

interpolation (see MPEP 2144.03 – official notice). It would have been obvious to one

having ordinary skill in the art at the time of the invention was made to include an

interpolation step because to fill in the missing image element to complete the entire

image so the observer will have a clear view of the scene in the image.

With regards to claim 11, Battle discloses all of the claim elements / features as

discussed above in rejection for claim 1 and incorporated herein by reference, but does

not explicitly disclose projection array includes identifying data representing a diffraction

pattern. Batlle (6.3. Boyer-Kak) discloses one slit pattern projection grid (see fig 10 –

projection grid from the left side projects light into the 'target' and the reflected from the

target is captures at the image plane). The projection array is derive from projection

grid, while it is well known that some of the energy from the light are reflected from the

target, the rest of the energy from the light ray are diffracted pass the target (see MPEP

2144.03 official notice). It would have been obvious to one having ordinary skill in the art

at the time of the invention was made to include projection array includes identifying

data representing a diffraction pattern because to retrieve as much energy from the

projected light, both the reflected and diffracted portion energy, to obtain a more

accurate readings of the projected information.

With regards to claim 24, see the rationale for claim 8.

With regards to claim 37, see the rationale for claim 9.

3.   Claims 14 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable

over Batlle ('6.1. Posdamer-Altschuler' in view of '6.3. Boyer-Kak').

Battle (6.1. Posdamer-Altschuler) discloses all of the claim elements / features as

discussed above in rejection for claim 1 and incorporated herein by reference, but fails

to disclose characteristics in the set is a color that is distinguishable. Batlle ('6.3. Boyer-

Kak') discloses a method of claim 12, wherein each of the characteristics in the set is a

color that is distinguishable from another color in the set (see page 971 – second

column 6.3. first paragraph lines 1 – 7). It would have been obvious to one having

ordinary skill in the art at the time of the invention was made to include characteristics in

the set is a color that is distinguishable because to ease the problem of segmentation of

sections of the image which contains desired information, such as eyes, mouth nose in

biometric identification, from the unimportant information such as the background of a

scene.

With regards to claim 28, see the rationale for claim 14.

3.   Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Batlle in

view of Malione (US pat no 6,341,016).

Batlle discloses all of the claim elements / features as discussed above in rejection for

claim 1 and incorporated herein by reference, but fails to disclose determining

correspondence information is performed without having to first determine

correspondence information for an element in the plurality of image elements that is

designated as calibrating. Malione discloses a method of claim 1, wherein the step of

determining correspondence information is performed without having to first determine

correspondence information for an element in the plurality of image elements that is

designated as calibrating the correspondence information for all other image elements

in the plurality of image elements (see col. 6 lines 55 – 58 – the camera captures the

projected image with RGB value then converts HUE color coordinates – then computes

the transformation at each point from data about measured response of each of the

three primary colors in the projected pattern – without the use of any calibrating

procedure). It would have been obvious to one having ordinary skill in the art at the time

of the invention was made to exclude the use of calibration to determine corresponds

information because using color transformation provides the user to easily segments the

image from the desired object or pixels from the undesired pixels like the background of
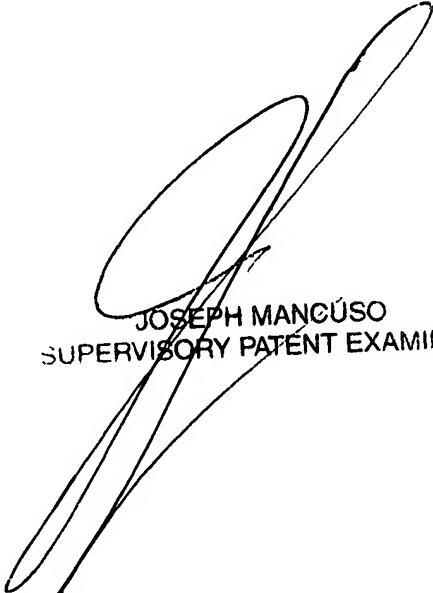
a scene.

Conclusion

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Alex Liew whose telephone number is (571)272-8623.

The examiner can normally be reached on 9:30AM - 7:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Joseph Mancuso can be reached on (571)272-7695. The fax phone

number for the organization where this application or proceeding is assigned is 571-

273-8300.

Information regarding the status of an application may be obtained from the

Patent Application Information Retrieval (PAIR) system. Status information for

published applications may be obtained from either Private PAIR or Public PAIR.

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For more information about the PAIR system, see http://pair-direct.uspto.gov. Should

you have questions on access to the Private PAIR system, contact the Electronic

Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

USPTO Customer Service Representative or access to the automated information

system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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9/1/06

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